DISTRIBUTION OF FRESHWATER FISH IN THE OTWAY REGION, SOUTH-WESTERN VICTORIA

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The distribution of freshwater fishes in the Otway region of south-western Victoria was determined from surveys carried out at 53 sites between 1982 and 1988. Eighteen fish species (14 native and 4 introduced) were recorded. The distribution of native fish appears to be related to geomorphological conditions that existed during and after the last glaciation 20,000–5,000 years ago. The short coastal streams east of Cape Otway may have formed after the Bass Strait land bridge was submerged, or may have been subjected to desiccation during an ensuing drier period. The native fish fauna of these streams consists of species with marine phases in their lifecycles and may have originated by recolonization from the sea. Although species with entirely freshwater lifecycles are absent from these streams, they are abundant in the Barwon, Aire and Gellibrand river systems, suggesting that these systems were less affected by geomorphological conditions due to their much greater size or to their location.

Australian grayling were collected from nine sites in the Otway coastal streams, and valuable populations of freshwater blackfish and of several species of Galaxiidae were also recorded. The discovery of a Tasmanian mudfish in Wye River provides a second location for this species in Victoria, and whitebait of Australian grayling were recorded from the Cumberland River. Brown trout were found to be widespread but other introduced species were rare in the coastal streams. The freshwater fish faunas of the Otway region and of northern Tasmania are compared. The importance of the Otway region in the conservation of native freshwater fish species is discussed and careful management is recommended.

THE FISH fauna of the Otway region (Fig. 1) of south-western Victoria, which forms part of the study area for the south-western regional water strategy plan (Natural Resources & Environment Committee 1984), has not been surveyed since the mid-1960s (Renowden 1968). Most of the recent faunal surveys conducted in the region (Emison et al. 1975, Bennett 1982, Pescott 1982, Conole & Baverstock 1983, 1985, King 1986, Wallis 1986, Earl & Bennett 1986) were primarily concerned with terrestrial vertebrates and gathered few or no data on fishes.

Here we report on recent surveys of freshwater fishes conducted at 53 sites in the Otway region. We compare the freshwater fish fauna of the coastal Otway streams with those of the larger river systems such as the Barwon and Gellibrand, and relate the distribution of the species to the geomorphological history of the region, to the species' life cycles and to availability of habitat.

The fish faunas of the Gellibrand and Barwon Rivers have been recorded by Tunbridge & Glenane (1988) and by Hall & Tunbridge (1988) respectively. Some information on the estuarine fish species of the region has been published by McCarraher (1986).

STUDY AREA

The Otway region is physiographically divided into the Otway Range and the coastal plains. The coastal plains, which are used primarily for agriculture, extend up to 50 km inland and are bounded to the north by volcanic plains. The Otway Range extends for almost 100 km from Aireys Inlet (38°28′S, 144°06′E) in the east to Moonlight Head (38°46′S, 143°14′E) in the west. The range is about 500 m high over most of its length, with Mount Cowley being the highest point at 670 m (Douglas 1975).

The wettest part of the region lies along the main ridge of the Otway Range where the mean annual rainfall is more than 1800 mm, and a marked rain shadow extends over much of the inland plains to the north-east (Lindforth 1975).

The two largest waterways in the region are the Barwon and Gellibrand Rivers which drain the northern slopes of the Otway Ranges and

have mean daily flows of 745 ML and 714 ML respectively (State Rivers & Water Supply Commission 1984). Both rivers have weirs on their upper reaches and have been the subject of stream-flow studies which provide recommended flow rates to maintain fish populations (Tunbridge & Glenane 1988, Tunbridge 1988). Both rivers have their headwaters in forested catchments but flow mostly through farmland. The lower reaches of the Barwon River flow through urban areas of the city of Geelong.

The Aire River system west of Cape Otway is the third largest waterway in the Otway region, the main river having a length of 40 km and a mean daily flow of 174 ML (State Rivers & Water Supply Commission 1984). Watercourses draining the main ridge east of Cape Otway are primarily short, fast-flowing streams emptying into the Southern Ocean. Many of these streams flow for less than 10 km and have mean flow rates of less than 60 ML per day. Many of them flow through forested catchments which remain in a relatively natural condition. Waterfalls are common on the coastal streams and often form natural barriers to fish passage.

Waters in the Otway region have been stocked with salmonids from as early as 1879, initially by the Geelong and Western District Fish Acclimatisation Society and later by Victorian Government departments (Barnham 1989). Most streams were stocked with brown trout, *Salmo trutta*, but rainbow trout, *Oncorhynchus mykiss*, were also released until 1968 at a smaller number of sites, including the West Barwon Dam and the lower reaches of the Barwon River (Wharton 1969). Only the Aire, Barham, Barwon, Ford, Gellibrand and St Georges (Reservoir Allendale) Rivers have been stocked with brown trout since 1970 (Barnham 1989). Between 1982 and 1986 the Barwon River was the only river stocked, receiving between 3000 and 5000 brown trout annually (Hume & Barnham 1986).

METHODS

The location of each site sampled is shown in Fig. 1. Map grid references for each site (obtained from 1:100,000 maps of the Topographic Survey National Map Series) as well as the names of streams and the dates and method of sampling are given in the Appendix.

A Smith Root MK VIA bank-mounted electrofisher (Koehn & McKenzie 1985) was used to sample fish at 52 sites. Jackson & Williams (1980) sampled site 20 by electrofishing in 1974. Rotenone was used by McCarraher (1986) at site 4 in 1977 and 1981, and by Baxter (1985) to collect spotted galaxias and Australian grayling at site 26 on 1 March 1982. A dip net was used to sample whitebait at site numbers 6, 7, 11, 14, 18, 21, 25, 30, 33, 42 and 45 (Appendix). Two sites were also sampled overnight as follows:

Sites 36 and 37: 4 single winged fyke nets (13 mm mesh)

Site 37: 25 mm, 50 mm, 75 mm, 88 mm, 100 mm and 125 mm mesh nets, each 25 m long.

Electrofishing was considered to be efficient at all sites (see Koehn & McKenzie 1985) for all species except lamprey ammocoetes which often avoided capture by burrowing. Dip net sampling for whitebait of the common galaxias at site 45 was not considered efficient for other species. Fish were identified in the field using Cadwallader & Backhouse (1983). If identification was uncertain, specimens were preserved in 10% formalin for later examination. The collections of the Museum of Victoria were checked for all fish species with localities in the Otway region.

RESULTS

Eighteen species of freshwater fish, 14 of them native and 4 introduced, have been recorded in the Otway region (Table 1). Species recorded at each site are listed in the Appendix. Species such as the small-mouthed hardyhead (*Atherinosoma microstoma*), Tamar River goby (*Favonigobius tamarensis*) and blue-spot goby (*Pseudogobius olorum*) occur in the estuarine reaches of many of the coastal streams (Cadwallader & Backhouse 1983, Tunbridge & Glenane 1983) but were not encountered during our survey. Similarly, the mainly estuarine flat-headed gudgeon (*Philypnodon grandiceps*) is expected to be more widespread than our results suggest.

The short-finned eel was the most widespread species, occurring at 49 sites. Species of galaxias were also widespread and often abundant, but only one specimen of the Tasmanian mudfish was found (at site 17). Australian grayling were caught at nine sites, but usually as juveniles and usually fewer than 10 in number. Juvenile grayling were captured in the lower reaches of the Cumberland River (Site 14) on 25 February 1987 and whitebait of this species were captured ascending the stream on 24 November 1987. Tupong were generally caught only in the lower reaches of streams. At site 14 tupong were found only below a roadway pipe in which water vel-

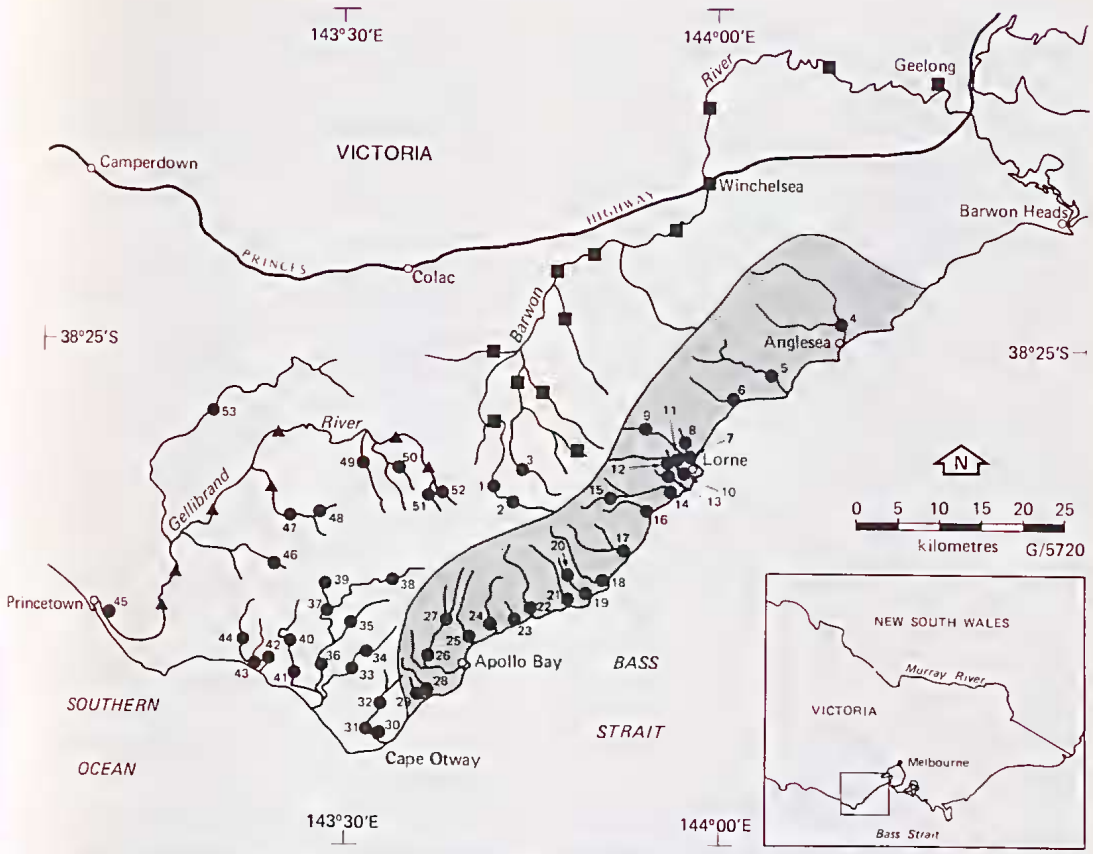

Fig. 1. Sites sampled during our survey (●) and those of Tunbridge & Glenane 1988 (▲) and Hall & Tunbridge 1988 (■). Shaded area indicates region where mountain galaxias, Australian smelt, southern pigmy perch and freshwater blackfish were absent.

ocity was high, and at site 7 were not present above steep rapids. Freshwater blackfish were found in some tributaries of the Gellibrand River but not in others having apparently suitable blackfish habitats but subject to extremely heavy sedimentation (sites 49 and 50).

Of the introduced species, only brown trout was widespread throughout the region, being particularly abundant in coastal streams where it was found at 60% of the sites. Only in the Parker River were brown trout absent from all three sites sampled. In the coastal streams only a few specimens of the other three introduced species were caught: mosquitofish at site 12 (St Georges River below the Lorne town water supply storage); two redfin, possibly escaped from the stock in a local dam, at site 6 (Grassy Creek); and one rainbow trout at site 36 in the Aire River.

The native fish fauna of the short coastal streams differs considerably from that of the Barwon and Gellibrand river systems. Freshwater blackfish, Australian smelt, mountain galaxias and southern pigmy perch were not found in any of the streams between Anglesea and Cape Otway (sites 4 to 29) although these species occurred in streams north of the Otway ridge and west of Cape Otway (Fig. 1). Southern pigmy perch were recorded in the Anglesea river by Atkins & Brourne (1982; cited in Raadik 1986) but we could not confirm the occurrence. The mountain galaxias was found in the Parker River (site 32), and freshwater blackfish and Australian smelt were present in the Aire River system. Three large specimens of freshwater blackfish having a maximum size of 527 mm TL were collected at site 36 (Aire River).

This species distribution is consistent with the findings of Renowden (1968) and with the localities of specimens in the Museum of Victoria.

Family	Scientific name	Common name	Abbreviation
Native species			
Mordacidae			
	Mordacia mordax (Richardson)	Short-headed lamprey	Shlamp
Geotriidae			
	Geotria australis Gray	Pouched lamprey	Plamp
Anguillidae			
	Anguilla australis	Short-finned eel	Sfeel
Galaxiidae			
	Galaxias maculatus (Jenyns)	Common galaxias	Cgal
	Galaxias olidus Gunther	Mountain galaxias	Mgal
	Galaxias brevipinnis Gunther	Broad-finned galaxias	Bgal
	Galaxias truttaceus Valenciennes	Spotted galaxias	Sgal
	Galaxias cleaveri Scott	Tasmanian mudfish	Tmudf
Retropinnidae			
	Retropinna semoni (Weber)	Australian smelt	Asmelt
Prototroctidae			
	Prototroctes maraena (Gunther)	Australian grayling	Agrayl
Kuhliidae			
	Nannoperca australis Gunther	Southern pigmy perch	Spper
Gadopsidae			
	Gadopsis marmoratus Richardson	Freshwater blackfish	Fbfish
Bovichthyidae			
	Pseudaphritis urvillii (Valenciennes)	Tupong	Tup
Eleotridae			
	Philypnodon grandiceps (Krefft)	Flat-headed gudgeon	Fhgd
Introduced Species			
Salmonidae			
	Salmo trutta Linnaeus	Brown trout	Btr
	Oncorhynchus mykiss Walbaum	Rainbow trout	Rtr
Poeciliidae			
	Gambusia affinis (Baird & Girard)	Mosquitofish	Mosqf
Percidae			
	Perca fluviatilis Linnaeus	Redfin	Rfin

Table 1. Freshwater fish species found in the Otway region. Abbreviations are those used in Appendix.

DISCUSSION

Geomorphological and climatic influences

During the last glacial epoch (18,000 to 15,000 years BP) the seabed of what is now Bass Strait formed a land link between Tasmania and mainland Australia (Bowler & Hamada 1971). The western edge of the link between King Island and the mainland extended close to the tip of Cape Otway and encompassed the present Otway coastal region (Jennings 1971). The small coastal streams on what is now the eastern side of the Otway Range may not have existed at that time. The rising postglacial sea-level first cut the land link between the Otway region and King Island between 15,000 and 10,000 years BP. The sea had risen almost to its present level by 5,000 years BP. Since then no major coastal geomorphological changes have occurred (Jennings 1971).

Major climatic changes have also occurred since the glaciation. Sometime after 9,700 years BP the climate around Lake Keilambete, about 70 km northwest of Cape Otway, became wetter, and was wettest between 6,500 years BP and 5,000 years BP (Dodson 1974). The water in the lake later fell to its lowest levels at about 3,500 BP and at about 770 BP, before reaching its highest level in the 19th century (Dodson 1974). The decreases in lake levels may reflect reductions in precipitation or increases in temperature and evaporation (Bowler & Hamada

1971). If the small coastal streams to the east of the Otway Range had been formed by this time they would have been susceptible to droughts and may have flowed intermittently. Interruption to their flow or their complete drying may have destroyed the freshwater fish fauna that had been present in them before about 770 BP.

Evidence that the original fish fauna in these streams may have been destroyed in this way is to be found in the extant native fish fauna consisting entirely of species which have a marine component in their life cycles and which could have recolonised from the sea. In contrast, the Aire, Gellibrand and Barwon river systems contain four species of native fish which spend their entire lives in fresh water. These river systems may not have been effected by the land bridge or, being much larger, were less influenced by the arid conditions.

The Australian smelt, a small forage species, was absent from the coastal streams but has been found in the Aire, Barwon and Gellibrand Rivers (Hall & Tunbridge 1988, Tunbridge & Glenane 1988). Freshwater blackfish are usually more abundant in habitats with low water velocities and with logs and wood debris which are used for instream cover and for spawning sites (Jackson 1978a, 1978b, Koehn 1986d). The coastal streams from which this species was absent are essentially low order streams that are fast-flowing but which commonly contain many pools where water velocity is low and wood debris present. The freshwater blackfish has been recorded in the Aire River system and is widespread throughout the Gellibrand and Barwon Rivers in similar habitats (Hall & Tunbridge 1988, Tunbridge & Glenane 1988). The southern pigmy perch is commonly associated with aquatic vegetation (Cadwallader 1979), with mud substrates (Jackson & Davies 1983), and with slow-flowing or still waters (Llewellyn 1974). Small areas of such habitats are present though not common in the Otway coastal streams, but southern pigmy perch were absent. The species has been recorded from the Gellibrand and Barwon River systems (Hall & Tunbridge 1988, Tunbridge & Glenane 1988).

Mountain galaxias were also absent from the coastal streams but were collected from tributaries of the Gellibrand and Barwon Rivers in habitats similar to those found in the Otway coastal streams. The absence of the mountain galaxias from the coastal streams cannot be attributed to the presence of large numbers of brown trout, which are known to exclude mountain galaxias (Tilzey 1976, Cadwallader 1979, Fletcher 1979, Jackson & Davies 1983), because the latter were collected from tributaries of the Gellibrand and Barwon Rivers where trout were widespread.

The presence of mountain galaxias in the Parker River and of freshwater blackfish, mountain galaxias and Australian smelt in the Aire River system delineates the boundary where fish distribution changes (Fig. 1). Although it is similar in size to other Otway coastal streams, the Parker River in the middle of Cape Otway may not have been subjected to the same geomorphological conditions as streams farther to the east.

The fish fauna in the Otway coastal streams is similar to that in the short coastal streams flowing east from the Mornington Peninsular ridge (Koehn 1986b), which may have been subjected to similar geomorphological and climatic conditions as the Otway region.

There are marked similarities between the native freshwater fish fauna of the Otway region and Tasmania, most species being common to these areas. The distribution of species whose life cycle is spent entirely in freshwater is especially interesting. In Tasmania, the southern pigmy perch, *Nannoperca australis*, and freshwater blackfish, *Gadopsis marmoratus*, occur naturally only in northern rivers flowing into Bass Strait (Frankenberg 1974). The Gadopsidae appears to be an entirely freshwater family that is restricted by salt-barriers. It has been suggested that the severe reduction or obliteration of freshwater streams on the Bass Strait islands during glaciation may have resulted in the extinction of *Gadopsis* from this region (Sanger 1986).

The dwarf galaxias, *Galaxiella pusilla*, was not found in our study area but it is present in western Victoria (Tunbridge & Glenane 1983). Populations of this species are also found on the north coast of Tasmania and on Flinders Island (Frankenberg 1974).

Frankenberg (1974) suggested that the freshwater blackfish, southern pigmy perch and dwarf galaxias migrated to Tasmania from the mainland when the landbridge existed and when continuities of fresh water were likely. In contrast, Sanger (1986), on the basis of work by Watson & Littlejohn (1985), favoured a northward dispersal of the freshwater blackfish from Tasmania. Frankenberg (1974) also suggested that the spotted and broad-finned galaxias may have migrated to the mainland from Tasmania during the same period. However, the occurrence of larval galaxiids as much as 700 km

offshore from New Zealand supports the theory of McDowall (1978) that long-range dispersal of diadromous species may occur despite oceanic barriers.

Recent influences

The distribution of fish species recorded during surveys in other waterways has often been correlated with the availability of suitable habitats (e.g. Cadwallader 1979, Jackson & Davies 1983, Koehn 1986a, 1986b, 1986c) and with access to those habitats. The wide distribution of the short-finned eel in the Otway region is indicative of the wide range of habitats which the species can tolerate (Cadwallader & Backhouse 1983) and of its ability to negotiate barriers. The common galaxias, though less able to negotiate barriers, is also widespread and was found in a variety of habitats. Species with more specific habitat requirements such as freshwater blackfish and tupong, both of which prefer slower-flowing waters (Koehn 1986d, unpublished data), had more restricted distributions. Tupong appear to be particularly susceptible to stream barriers and were not found in the upper reaches of steep streams, although they are found well inland in larger rivers such as the Gellibrand (Tunbridge & Glenane 1983). During our survey tupong were not found above the "rapids" on the Erskine River nor above a road crossing on the Cumberland River consisting of pipes where uniform water velocities were particularly fast.

Freshwater blackfish are common in the Gellibrand and Barwon river systems but were not found in Charleys and Lardners Creeks, tributaries of the Gellibrand River, despite the presence of ample suitable habitat. Both these sites had been subjected to extremely heavy sedimentation, probably due to the establishment of surrounding pine plantations, and this may have contributed to the absence of freshwater blackfish. The eggs of freshwater blackfish die if they remain covered with silt (Koehn unpublished data). Moreover, because this species requires a clean surface on which to lay its adhesive eggs, spawning may not take place or may be unsuccessful if suitable sites are covered by a thick layer of sediment.

Fish distributions in the Otway region probably have not changed markedly in recent years as our results concur with those of Renowden (1968) and Baxter (1985), but a major change has occurred during the past century with the introduction of trout. Brown trout were particularly abundant in the cool, well-oxygenated waters of the Otway coastal streams, which suit the habit of this species and contain gravel substrates which it requires for spawning (McDowall & Tilzey 1980). Apart from creating widespread populations of a new species, such introductions are likely to have affected the distribution of native fish species.

Published literature suggests that the broad-finned galaxias is usually found in fast-flowing water in the upper reaches of steep, rocky streams (Cadwallader & Backhouse 1983). Our results show that the species is also found in slow-flowing reaches of streams where the short-finned eel was the only other species present. The distribution of the broad-finned galaxias may be severely affected by the presence of other species, particularly brown trout (Jackson & Williams 1980) which at some sites appeared to restrict the broad-finned galaxias to shallow riffles not accessible to trout (Koehn unpublished data). Brown trout are voracious predators and in many areas fish can form a large part of their diet. The effects of brown trout on the distribution of the mountain galaxias are more comprehensively documented, mutually exclusive populations of these two species being common (Tilzey 1976, Cadwallader 1979, Fletcher 1979, Jackson & Davies 1983). It has been suggested that brown trout may also be detrimental to Australian grayling, *Prototroctes maraena* (Jackson & Koehn 1988).

The other three introduced species in the Otway coastal streams were neither abundant nor widespread, in contrast to the large numbers of six introduced species present in the Barwon and Gellibrand Rivers (Cadwallader & Backhouse 1983, Hall & Tunbridge 1988, Tunbridge & Glenane 1988). Predation, particularly by trout and redfin, as well as competition for food and space by introduced species can be especially detrimental to native fish populations (Cadwallader & Backhouse 1983). The introduction of additional exotic species should therefore be avoided.

CONSERVATION AND MANAGEMENT

The Otway region, in particular the Otway Range, is considered to be an important conservation area where many streams have been given high conservation status (Tunbridge & Glenane 1983, Macmillan et al. 1987). Although none of the fish species found in the region is considered endangered at present, several species are con-

sidered to be under some threat (Cadwallader et al. 1984).

The fish species with the greatest conservation need in the Otway region is the Australian grayling. This species was classified by Cadwallader et al. (1984) as "vulnerable in Victoria" but is likely to be considered endangered in the near future if the population continues to decline. Australian grayling were collected from nine sites in the study area, most of the samples consisting of a few young individuals taken from coastal streams. More than 100 Australian grayling have been taken from a population monitored in the Barwon River (Hall & Tunbridge 1988, Jackson & Koehn 1988). The collection of Australian grayling whitebait ascending the Cumberland River adds to our knowledge of the lifecycle of this species. The Otway region should be considered an important conservation area for this species because of its widespread distribution in coastal streams.

The broad-finned galaxias, the spotted galaxias and the Tasmanian mudfish were all listed by Cadwallader et al. (1984) in Category C; that is, species that are rare or have a restricted distribution in Victoria. Broad-finned and spotted galaxias were widespread and abundant in the Otway coastal streams. The Tasmanian mudfish was first found on mainland Australia at Wilsons Promontory (Jackson & Davies 1982). Discovery of a specimen in Wye River in 1983 extends the known range of the species into western Victoria. The swamp areas normally inhabited by adults of this species pose sampling difficulties, and a study of the whitebait stage (Fulton 1986) may determine other localities.

The conservation status in Victoria of the pouched lamprey, which was recorded at six sites, has been listed as "indeterminate", i.e. possibly threatened (Category D of Cadwallader et al. 1984).

Because the fish fauna of the Otway coastal streams consists of species which need to migrate between the sea and fresh water at some stage of their lifecycles, the maintenance of fish passage in these streams is important. Passage of many species into the upper reaches of several streams is restricted by natural barriers such as waterfalls. Only short-finned eels and broad-finned galaxias occur naturally above such barriers, an indication of the extraordinary climbing and migratory capabilities of these species. Most other species are much more restricted by stream barriers and are thus more easily cut off from available habitat by small weirs or culverts.

The native freshwater species most widely sought by anglers in southern Victoria is the freshwater blackfish (Barnham 1983). One of Victoria's most valuable populations of this species is found in the Gellibrand River which has the highest reported percentage of freshwater blackfish longer than the minimum legal length (220 mm TL). This river is one of the few that still contain large specimens of this species (Tunbridge & Glenane 1988).

Not surprisingly, the Gellibrand River is one of the most popular freshwater fishing venues in Victoria. Most anglers (76%) on the Gellibrand River seek freshwater blackfish (Koehn 1984) and are attracted by the prospect of catching a trophy fish. The range of this species has been considerably reduced (Jackson & Llewellyn 1980) and the Gellibrand River needs to be given a high level of protection. Careful land management and the provision of adequate buffer strips are required to avoid the heavy sedimentation seen at two sites.

The Gellibrand and Barwon Rivers are classified as sport fisheries for the freshwater blackfish (Tunbridge & Glenane 1983), and streams in the Otway region provide many opportunities for anglers seeking brown trout. Large numbers of brown trout of suitable size were present at most of the sites we sampled and, despite decreases in stockings, most streams have viable, self-maintaining populations of this species.

The Otway region contains a valuable assemblage of mainly native freshwater fish and the introduction of other species should be prevented. The region provides excellent conservation areas for many fish species in addition to opportunities for recreational angling for freshwater blackfish and brown trout. Most of the streams maintain riparian vegetation, instream cover and substrate free of silt, all attributes which have been lost from many river systems. If these valuable fish faunas and their habitats are to be retained, careful management is needed.

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APPENDIX

Localities sampled and species present.

Site No.	Stream Name	Map No.	Grid Ref.	Date Sampled	Species Present
1	West Barwon Dam	7620	360 290	29.7.88	Sfeel,Cgal,Btr
2	West Barwon R	7620	370 264	19.1.88	Sfeel,Cgal,Fbfish,Btr
3	East Barwon R	7620	393 294	21.1.88	Sfeel,Mgal,Fbfish,Btr
4	Anglesea R	7721	540 463	1977,1981	Sfeel,Cgal,Sgal
5	Painkalac Ck	7721	460 403	24.3.87	Plamp,Sfeel,Cgal,Sgal
6	Grassy Ck	7721	407 362	24.2.87	Sfeel,Cgal,Sgal,Bgal,Agrayl,
				6.5.87	Tup,Fhgud,Btr,Rfin
7	Erskine R	7620	590 305	4.3.86	Plamp,Sfeel,Cgal,Bgal,
				March 1987	Sgal,Agrayl,Tup,Fhgud,Btr
8	Little Erskine R	7620	588 312	5.3.86	Sfeel,Cgal,Bgal
9	Erskine R	7620	538 337	March 1987	Sfeel,Btr
10	St Georges R	7620	577 288	25.2.87	Sfeel,Cgal,Sgal,Btr
11	Cora Lynne Ck	7620	571 303	17.3.87	Plamp,Sfeel,Bgal,Btr
12	St Georges R	7620	565 300	25.2.87	Sfeel,Bgal,Mosqf
13	She-Oak R	7620	563 284	24.2.87	Sfeel,Bgal,Btr
14	Cumberland R	7620	566 264	25.2.87	Plamp,Sfeel,Cgal,Sgal,Bgal,Agrayl,Tup,Btr
15	Cumberland R	7620	260 487	2.3.87	Sfeel,Bgal
16	Jamieson R	7620	540 238	17.7.87	Sfeel,Cgal,Bgal,Sgal
17	Wye R	7620	514 196	14.9.83	Lamp,Cgal,Sgal,Tmudf,
				30.4.84	Agrayl,Tup,Btr
				14.11.84	
18	Kennett R	7620	487 162	26.2.87	Sfeel,Cgal,Bgal,Sgal,Agrayl,Fhgud,Tup,Btr
19	Grey R	7620	468 145	2.5.84	Sfeel,Cgal,Sgal,Btr
20	Grey R	7620	450 171	1974	Sfeel,Bgal
21	Carisbrook Ck	7620	443 135	15.11.84	Sfeel,Cgal,Sgal,Agrayl,Btr
22	Smythes Ck	7620	400 124	26.2.87	Sfeel,Cgal,Bgal,Sgal,Btr
23	Browns Ck	7620	380 113	21.5.87	Sfeel,Cgal,Sgal,Btr
24	Skenes Ck	7620	350 106	26.2.87	Sfeel,Cgal,Sgal,Agrayl,Tup,Btr
25	Wild Dog Ck	7620	327 097	12.1.84	Plamp,Sfeel,Cgal,Bgal,Sgal,
				8–10.5.84	Agrayl,Tup,Fhgud,Btr
26	Barham R	7620	280 072	1.3.82	Sfeel,Cgal,Sgal,Agrayl,
				19.5.83	Tup,Btr
27	Barham R	7620	291 016	18.5.83	Sfeel,Cgal,Btr
28	Elliott R	7620	272 039	1974	Sfeel,Bgal
29	Geary R	7620	264 033	1974	Bgal
30	Parker R	7620	205 975	18.11.88	Sfeel,Cgal,Bgal,Sgal
31	Parker R	7620	205 975	3.3.87	Sfeel,Bgal
32	Parker R	7620	218 025	3.3.87	Sfeel,Mgal,Bgal
				19.1.88	
33	Calder R	7620	180 054	3.3.87	Sfeel,Cgal,Sgal,Fbfish,Btr
34	Calder R	7620	187 075	3.3.87	Sfeel,Bgal,Btr
35	Clearwater Ck	7620	184 103	3.3.87	Sfeel,Mgal,Bgal

36	Aire R	7520	148 072	27.11.86 6.8.87 15.2.88 20.1.88	Shlamp,Sfeel,Cgal, Sgal,Asmelt,Agrayl, Fbfish,Tup,Fhgud, Btr,Rtr
37	Aire R	7520	152 131	9.12.86	Sfeel,Bgal,Btr
38	Aire R	7620	232 165	9.12.86	Sfeel,Bgal,Btr
39	Young Ck	7520	168 168	5.3.87	Bgal,Btr
40	Ford R	7520	105 099	5.3.87	Plamp,Sfeel,Sgal,Fbfish,Btr
41	Ford R	7520	112 052	5.3.87	Shlamp,Plamp,Sfeel,Cgal,Sgal,Btr
42	Johanna R (east)	7520	080 077	16.7.87	Lamp,Sfeel,Cgal,Bgal,Sgal
43	Johanna R	7520	063 072	16.7.87	Plamp,Sfeel,Cgal,Btr
44	Johanna R	7520	055 094	16.7.87	Sfeel,Bgal
45	Gellibrand R	7520	892 144	24.11.87	Cgal
46	Chapple Ck	7520	040 193	21.1.88	Sfeel,Bgal,Fbfish,Btr
47	Carlisle R	7520	107 245	21.1.88	Sfeel,Sgal,Fbfish,Btr
48	Carlisle R	7520	168 255	21.1.88	Plamp,Sfeel,Btr
49	Charleys Ck	7620	210 287	21.1.88	Sfeel,Sgal,Btr
50	Lardners Ck	7620	238 295	20.1.88	Lamp,Sfeel,Btr
51	Asplin Ck	7620	287 273	20.1.88	Mgal
52	Gellibrand R	7620	313 268	20.1.88	Shlamp,Sfeel,Bgal,Btr
53	Tomahawk Ck	7521	020 368	4.3.87	Sfeel,Cgal,Spper

Lamprey ammocoetes observed but not captured at sites 17, 42 and 50 could not be identified to species level but are recorded as Lamp.